The following statement gives the output for the calendar year from the various taluks:—

NAME OF LICENSEE	TALUK	OUTPUT					
		1912		1913		1914 January to June	
		cwts.	lbs.	cwts.	lbs.	cwts.	lbs.
1. V. Sivaramiah Chetty ...	Chamrajnagar ...	6	87	.....		.....	
2. M. Balaji Rao	Malvalli ...	38	4	.....		.....	
3. Katte Ramiah and Abdul Shukur.	Maddagiri ...	425	0	1,100	50	378	44
4. Katte Venkataramiah ...	Koratagere ...	1,705	90	1,851	88	151	88
5. Abdul Gaffur Saheb ...	Sidlaghatta ...	295	14	.....		.....	
6. Shanbhog Hanumanthappa...	Tumkur ...	87	94	67	42	.....	
7. B. Mohadeen Saheb ...	Sidlaghatta ...	317	34	285	76	151	40
8. Narayanjee Vindravan and K. Heerachand.	Dodballapur ...	.....		94	97	80	106
9. K. Heerachand... ...	Kunigal ...	.....		34	17	.....	
10. Narayanjee Vindravan ...	Gubbi ...	.....		45	60	10	19
11. T. Abdulla Saheb ...	Pavagada ...	.....		201	28	.....	
12. Dosa Sheriff Sait ...	Arsikere ...	.....		341	58	.....	
	Total ...	2,875	99	4,022	68	772	73

D.—INSPECTION OF MINES.

I. General.

I continued to be in charge of the Inspection of Mines during the year.

Chief Inspector of Mines.

Seven visits covering 39 days were made to the Kolar Gold Field in connection with accident enquiries and general inspection. Inspections were also made of the Jalagargundi Mine, the gold prospecting blocks in the neighbourhood of Honnali, the Workington's property at Shimoga, the prospecting work for Iron Ore on the Bababudans, and the chrome workings at Shinduvalli.

Inspector of Mines.

During the year under report Mr. R. Bocquet, who had been on furlough, returned on the 29th November 1913 and assumed charge of the office and duties of the Inspector of Mines, and, since that date, has been in residence on the Kolar Gold Field.

Deputy Inspector of Mines.

Mr. L. H. Beckwith, who continued to officiate as Inspector of Mines until relieved of his officiating appointment on the above date, was also in residence on the Kolar Gold Field throughout the year with the exception of 18 days' privilege leave of absence from the 13th to 30th May 1914 (both days inclusive).

As usual all the fatal and the more important serious accidents were personally enquired into and, the localities in which they occurred, invariably inspected. Mr. Suryanarayana Rao, Mining Assistant, rendered valuable assistance and enquired into the majority of the less important accidents. He was absent on privilege leave for one month and three days with effect from the 9th July 1913 and again for ten days from the 27th May 1914.

In addition to this work, as far as time permitted, systematic inspection of the underground workings was carried out by the Inspectors of Mines, all working places being visited during the year, the majority of them more than once. The routine work of the office was

attended to, prosecutions conducted and many enquiries held into cases which did not result in accidents but constituted breaches of the Mining Rules.

The Deputy Inspector of Mines held the usual examinations for the grant of certificates once in each week; when necessary, assistance was given by the Inspector of Mines.

Inspection Bungalow and Office.

The Inspection Bungalow, occupied by the Officiating Inspector of Mines, was vacated by him on the return to duty of the Inspector of Mines from long leave, the latter taking up his residence in it from the date of his return to duty. A small extension has been sanctioned to the north wing of the above bungalow and the work put in hand.

The new building for the office of the Inspector of Mines, sanctioned by Government in their Proceedings No. (Geological) 2145-7, dated 24th February 1913, was commenced in the middle of March 1914, since when the work has proceeded without interruption and good progress has been made. It is hoped the building will be ready for occupation before the end of the calendar year 1914.

Certificates.

The following table shows the number of examinations held and certificates granted up to the end of the year:—

YEAR	MESTRIS		BLASTERS	
	Number examined	Number passed	Number examined	Number passed
Total up to June 1913	7,929	7,680	5,723	5,483
For 1913-14	560	559	471	443
Total ...	8,489	8,239	6,194	5,926

Duplicate tickets (discs) to the number of 48 were also issued to Mestris and 7 to Blasters who had lost the originals held by them.

II. Labour employed.

The number of persons employed in the Mining Industry in 1913 was 27,027 against 27,088, showing a decrease of 61.

Of this number, 25,571 were employed in Gold Mining against 26,508 in 1912, 588 in Manganese Mining against 511 in 1912, and 218 in Mica Mining against 69 in the previous year. In Magnesite Mining 323 persons were employed, 317 in Chromium and 10 in Copper Mining.

Of the 25,571 employed in Gold Mining, 525 were Europeans, 336 Anglo-Indians, and 24,710 Indians, a total of 14,970 being employed on underground and 10,601 on surface work.

III. Accidents.

(a) Statistics for the year 1913.

The total number of accidents reported for the year 1913 was 286 as against 294 during the year 1912.

Of these accidents:—

47 were fatal,
231 were serious,
8 were non-mining.

Total 286

The total number of fatal and serious accidents was therefore 278 being at the rate of 10·29 per 1,000 persons employed.

The corresponding figures for the year 1912 were 285, a rate of 10·52 per 1,000 persons employed.

Of the above 278 separate accidents :—

38 or 13·67 per cent were due to negligence,
31 or 11·15 per cent were due to recklessness, and
209 or 75·18 per cent were classed as unavoidable.

The corresponding figures for the year 1912 are :—

30 or 10·53 per cent were due to negligence,
26 or 9·12 per cent were due to recklessness, and
229 or 80·35 per cent were classed as unavoidable.

In the 47 fatal accidents, 112 persons were killed, which gives a mortality of 4·14 per 1,000 persons employed, as against a mortality of 3·32 per 1,000 employed during the year 1912.

The death rate in the gold mines, which as usual employed the greater proportion of the labour, was 4·38 per 1,000 against 3·36 in 1912.

In both groups these figures show a considerable increase over those of the previous year, but this can be accounted for by the fact that in one accident alone, which occurred at Edgar's Shaft, Mysore Gold Mine, on the 21st August 1913, no less than 42 persons were killed or 37·50 per cent of the total fatalities. Eliminating this one disastrous occurrence, the figures would then compare very favourably with 1912 and previous years reducing the death rate to 2·59 per 1,000.

There were 6 fatal accidents during the year which involved the loss of 2 or more lives, 71 persons altogether being killed in these 6 cases or 63·39 per cent of the total number of fatalities. Of these, 5 were due to unavoidable causes and 1 to negligence.

During the year 1913 air blasts and quakes were responsible for 8 accidents involving the loss of 31 lives. This compares favourably with the previous year in regard to the actua number of accidents, but the mortality is a little greater, the corresponding figures for 1912 being 11 accidents in which 29 persons were killed or who eventually died from the results of injuries received.

In four of the above accidents due to this cause no less than 27 persons lost their lives, three occurring at the Champion Reef and the other at the Ooregum Gold Mine.

The total number of fatal accidents for the same period in connection with the use of explosives in blasting operations underground, all of which occurred on the Kolar Gold Field, was 8 involving the loss of 8 lives. Compared with the previous year there is a considerable reduction, the corresponding figures being 10 accidents involving the loss of 15 lives.

Of the fatal accidents due to explosives :—

1 was caused by the premature explosion of the charge (attempting to fire too many holes in one round),

1 was due to the presence of some blasting gelatine—probably in a socket—while "picking" up loose ground,

and 6 were caused by boring into misfires or sockets containing a portion of a charge of blasting gelatine.

Of the above 8 fatal accidents all, with one exception (classed as unavoidable), were due to negligence or recklessness on the part of the mestris and blasters concerned, *i.e.*, persons in charge.

Of the 47 fatal accidents in 1913 :—

22 or 46·81 per cent were unavoidable,
9 or 19·15 per cent were due to recklessness,
16 or 34·04 per cent were due to negligence.

Of the 231 non-fatal accidents :—

187 or 80·96 per cent were unavoidable,
22 or 9·52 per cent were due to carelessness or recklessness,
22 or 9·52 per cent were due to negligence.

Classification of accidents in 1913.

	Fatal accidents	Non-fatal accidents	Deaths	Serious injuries
1. Air-blasts (quakes)	3	5	19	6
2. Air-blasts (bursts of rock) ...	5	67	12	82
3. Falls of loose rock	4	13	4	14
4. Falling in shafts, stopes, etc. ...	14	12	14	13
5. Explosives (misfires, etc.) ...	8	15	8	21
6. Trucks and Tramways	0	34	0	34
7. Run over or struck by skips ...	2	4	3	5
8. Hoisting	3	6	44	6
9. Other machinery	2	5	2	5
10. Falls of rock and materials in shafts...	2	9	2	10
11. Other causes	4	61	4	61
Total ...	47	231	112	257

Non-casualty accidents reported under Rule 165 of the Mysore Mining Rules.

Twenty-two non-casualty accidents were reported under this head during the year caused as follows :—

(1) Engine running out of control 1
(2) Fracture of any essential part of winding engine, crank shaft, couplings, bearings, gearing, clutch, drums, or drum shaft ... 2
(3) Fracture of winding rope or of its attachment to skip, cage, or drum 2
(4) Fracture of pit-head sheave or axle or bearings of same .. 0
(5) Failure of efficiency of brake 0
(6) Failure of safety catch to act when required 0
(7) Failure of device for prevention of overwinding or of detaching hook to act when required 0
(8) Overwinding of cage or skip 17
(9) Bursting of anything containing steam, compressed air or other substance at high pressure 9

Penalties were inflicted in 11 cases and varied from a fine of one day's pay to dismissal.

(*b*) NOTES ON ACCIDENTS.

Few accidents of the year call for special comment, but unfortunately the most serious of its kind which has ever occurred in these mines took place at the Mysore Mine and resulted in the loss of 42 lives.

Edgar's Shaft Cage Accident.

The accident took place at Edgar's Shaft, Mysore Mine, on the 21st August 1913 and was due to the fall of a double decked cage carrying 42 men in consequence of the fracture of a portion of the clutch which secures the winding reel to the engine shaft. The accident was of an altogether exceptional character and was made the subject of enquiry by a special Commission appointed by Government. The Commission drew up a report which has already been published together with a Government Order thereon. The Commission expressed the

opinion that the accident was not traceable to any negligence on the part of the employees of the mine and that the machinery appeared to have been carefully designed and in good working order. A further departmental enquiry into the technical features of the accident has been made, but the cause of the fracture of the pin of the clutch, which was the immediate cause of the accident, remains unexplained. The material of the pin is reported to have been quite sound and its strength ample for the work it is normally called upon to do, but it has been pointed out that it may have been subjected to bending stresses which were not allowed for. It has been decided to discontinue the use of this clutch and a clutch of a different design will be adopted in future. In the meantime the clutches on the engine have been securely bolted up so that they are now out of commission and the winding is being carried on without them at some inconvenience to the progress of work.

The fact that the brakes failed to arrest the cage, although they complied with the statutory requirements both before and after the accident, has been the subject of special investigation and it has been calculated that in the exceptional circumstances of this accident, in which the reel had become detached from the shaft and was moving at a high speed, the weight actuating the brake was insufficient to overcome the momentum of the moving masses and bring the cage to rest. In consequence of this decision the reel has been strengthened to enable it to withstand a greater brake pressure and the weights have been increased. This increase of brake pressure is not considered to be necessary at present as the clutches are out of commission, but has been introduced for the sake of experience with a view to subsequent work when new clutches are fitted.

With regard to safety catches for stopping the descent of the cage, it is admitted that no catches would have been of any use in this particular accident and that there is no form of safety catch which could be usefully applied in the shaft. The question of the possibility of introducing certain forms of safety catches in new shafts is still under consideration.

Full details of the accident and of the results of the enquiry will be found in the Appendix to this report.

Accident at Circular Shaft, Champion Reef Mine, due to detachment of bucket from rope.

This accident, in which three men were killed, presents some features of interest. The Circular Shaft, about 3,800 feet in depth, is lined with brick and the sinking and bricking has been carried on by means of a massive wooden stage suspended from capstan ropes.

A large bowk, or bucket, attached to a winding rope by a well-known form of hook or clevis carries men and materials up and down the shaft. At the time of the accident sinking had been completed and the equipment of the shaft with bearers and guides was in progress. The stage was suspended about 1,360 feet from the bottom of the shaft and is provided with central doors to permit of the bowk passing through.

The stage had been moved up and down several times during the shift and after each move the position of the bowk when it reaches the stage is marked on the drum or rope. The last move was downwards for about 60 feet the bowk being at surface. Three men got in and were lowered with instructions to ring 1 when near the stage the doors of which were closed. The driver lowered and slowed off when he judged the bowk to be near the stage. The signal 1 was received and the bowk stopped almost at once. The signal to raise was then received and the rope with the clevis intact was wound up to surface but no bowk was attached. Men who were on the stage say that the bowk descended slowly, broke through the doors and fell to the bottom of the shaft, but were unable to say how it had become detached from the clevis. The rope was brought to rest within a few feet of the bowk striking the stage. The first point is how the bow of the bowk became detached from the clevis. The latter is a strong iron hook, but the entrance to the hook is closed by a tongue, opening inwards, and kept in position by a lever or bridle the weight of which keeps the tongue pressed against the point of the hook making the latter a closed ring. As neither the bow nor the clevis were damaged in any way it is necessary to account for the bow getting out of the latter. When the bowk struck the stage the jerk must have thrown the clevis upwards and turned it so that the tongue was nearly horizontal instead of nearly vertical. The weight of the bridle would then cause the tongue to open downwards and the bow must have been momentarily immediately below the opening permitting the clevis to fall or be jerked

off it before the bowk got away through the broken doors. The incident must have been practically instantaneous and those on the stage were unable to observe what happened.

The clevis is a good one and has been in use for many years without any mishap and the chance of the precise movements by which it became detached taking place again is exceedingly remote. A screw bolt has now been provided which pins the tongue and the point of the hook together so that the former will remain closed no matter into what position the clevis may be turned. The bolt will be used when men are travelling or when steady work is in progress with a single bowk. I do not consider it possible to insist on its use when fast winding of stuff is going on during sinking during which time full and empty bowks are changed regularly at the top and bottom of the shaft.

Another more important point is that at any change of level of the stage the bowk should invariably be lowered to the stage and the position mark made on the drum before men are allowed to go down in it. This means that some one should always remain on the stage when its position is changed in order to signal the advent of the bowk. This procedure will be adopted in future and there should be no room for any error of judgment on the part of the driver as to the exact position of the stage.

Air-blasts.

During the year 1913 the number of fatalities from air blast was 31 compared with 29 for 1912, an increase of two. For the official year 1913-14 the results are however more favourable than for the preceding year and there is a general impression that during the latter portion of the year blasts have not been quite so frequent or so severe.

Extracts from an interesting report by Mr. Henry M. A. Cooke on the Seismological observations will be found in the next section. It is too early to say whether there is any appreciable reduction in the number or severity of these phenomena and as accidents have a habit of going in runs with intervals of comparative freedom one hesitates to say much about their behaviour.

For some years past the most strenuous efforts have been made to cope with these dangerous and difficult phenomena and neither money nor thought has been spared. Timbering has been increased to an altogether unusual extent, systematic filling has been in progress for years and portions of the mines which are considered to be particularly liable to danger have been closed or abandoned. Further proposals regarding changes in methods of stoping or development are under constant discussion and trial and I have no doubt that any sound and workable scheme which was put forward would receive ample attention and fair trial.

One trouble is that we really understand so little about the precise nature or origin of so many of these air blasts and quakes and another lies in the fact that any particular line of action may take so long to make its influence felt and the results may be so obscured by a variety of complications that it is often impossible to say whether an improvement is being effected or not, or to what precisely any improvement may be due.

There is one and only one way to avoid entirely accidents due to air blasts and that is to close the mines down altogether. That would be like curing a man of being sick by cutting his throat, but the position by no means warrants any such drastic procedure. The larger accidents in which a number of lives are lost are undoubtedly impressive and awe inspiring, but taken over a number of years the average fatalities are by no means very excessive though regretably high. We hope and believe that this average is capable of being reduced, but ordinarily speaking the majority of these accidents must be regarded as unavoidable taking into account conditions and experience at the time. This remains substantially true even though the results of work or methods in the past and now should succeed in securing more satisfactory results in the future. Although there can be no question of closing the mines as a whole, there may be good reasons for closing certain portions which are believed to be specially liable to danger or which present features which are considered to be undesirable according to our present lights. If we consider the great uniformity of the rocks throughout the Kolar Field it is difficult to understand why these air blasts should be so markedly concentrated in Champion Reef. The fact that veins dip less steeply in Mysore, which has been on the whole comparatively free from these shocks, and much more steeply in Champion Reef and Ooregum which have suffered most, does not appear to help us, but rather the contrary.

About 10 years ago when these phenomena began to attract serious attention and I took up a serious study of them the southern portion of Ooregum was I think the most affected region. Since then the Champion Reef has taken the premier place in this undesirable contest and in view of the general uniformity of the rocks one seeks for other features in which a maximum or minimum is reached in the most affected areas. A study of the underground workings shows that in Champion Reef down to the 25th level we have the area of maximum intensity of stoping for the whole field. Although in the Mysore Mine a greater bulk of rock has been removed the stoping has been spread over a wider area or rather series of areas with intervening patches of solid country whereas in Champion Reef stoping has been almost continuous from one end of the mine to the other from about the 19th to the 25th level and whether the conclusion is justified or not the association of this feature with the increase of air blasts in this zone is a reasonable hypothesis in the investigation of an intricate problem.

As the result of detailed discussion of the problem with Mr. Henry Gifford, the Superintendent of the Mine, it was decided during the year to shut down the whole of this large section of the mine and to allow it to fire itself off if it wants to do so for some considerable period. Enormous quantities of waste rock have been put into these stopes for some years past, but this has not sufficed to check the air-blasts ; on the contrary they have increased. We hope that in the course of time the air blasts will tend to wear themselves out and that the fractured hanging wall will rest comfortably and securely on the filling. It may then be possible to attach the valuable ore reserves in the area. It may not be realized what a decision of this character may mean from a mining point of view and it may be well to note for the information of those who appear to think that the Mining Companies take no trouble or shirk expense to avoid accidents that the closing of this section means the locking up of a good deal of valuable ore which has already been developed and opened up and from which a quarter of a million sterling, or more, could be easily and cheaply extracted. How long it will remain locked up or whether it will be lost for ever must be left to the future to decide.

In pursuance of the same policy endeavours are being made to prevent a repetition of the special circumstances of this case and to arrange for working in distinctly separated blocks. In many cases this is easy enough as the shoots are usually separated by large patches of barren ground, but the idea is to go farther than this and to divide up the shoots themselves into alternate stoping sections and huge pillars. From a mining point of view it may not be easy to carry this out and the problem of attacking the huge pillars will then remain. The scheme is however under discussion and I hope that in default of any thing better it will be possible to introduce it with appropriate modifications to suit the circumstances of different mines.

With regard to the filling of stopes, at any rate on the steeper portions of the veins, the practice of taking the stopes down a certain distance and then putting in a stull and filling above it before continuing the stope in depth has been discontinued for some time past. These stopes are now carried down the whole depth of 100 feet or so from one level to another without any filling, but with stulls at intervals covered with heavy lagging so as to catch up pieces which may fall or burst off. In the case of an air-blast some or all of these stulls might be broken or thrown out, but our experience has been that the same thing occurs even when filling has been put in above; only in the latter case the filling is likely to go to the bottom and increase the mess and the difficulty of rescue. The main reason for the change of procedure is that in filling shallow sections of stopes there is great difficulty in securing complete filling and compactness in these shallow sections with the result that at the end of it all the filling is not of much use and does not help to support the hanging for a long time. This means heavy pressure on the unstoped margins for a long time and tending for the hanging to continue to fracture. Under the present scheme when the stope has been completed to its full depth the filling is shot right down from top to bottom forming a much more compact mass. This is done before the next section of the stope is taken down and so far as we can judge the scheme has been satisfactory.

I have referred to this before, but I do so again now in order to suggest that this more effective filling may be producing some beneficial effect in regard to the general tendency for quakes to occur in stoped areas.

As I have already said we cannot expect to get rid of air-blasts and quakes. In discussing these phenomena some years ago * I endeavoured to distinguish between air-blasts and quakes both in regard to intensity and mode of origin. Since then the air-blasts or the bursting of rock as a result of internal strain and unconnected with pressures developed by the stoping out of large areas have shown a tendency to increase in violence. At any rate much more violent bursts are now known and recognized than was the case ten years ago. This appears to be quite local and sporadic but the fact that they are sufficiently violent to break large quantities of rock and to fracture timbers suggests that many quakes which occur in the neighbourhood of pillars in stoped areas may sometimes be due to the same cause and not merely to strain or fracture caused by excessive superincumbent pressure.

The following extract from a report on a case which occurred on the 20th August 1913 at the bottom of Carmichæl's Shaft, Champion Reef, may be of interest as showing the conditions under which air-blasts may occur.

Air-blast in the sink of Carmichael's Shaft, Champion Reef Mine.

I inspected the scene of the accident on the morning of the 22nd August in company with the Superintendent, the Chief Underground Agent and Mr. Beckwith.

The shaft is now nearly 4,700 feet from surface on the underlie, it is in the hanging wall, about 70 feet west of the lode, and there has been no stoping for a distance of 1,000 feet above the scene of the accident. Except for a few cross cuts and levels the shaft is in rock which is solid for 1,000 or more feet in every direction around the point at which the air-blast took place.

Moreover this shaft has now been sunk for over 4,000 feet and the Superintendent informs me that hitherto it has been free from troubles of this kind.

Both from the surrounding conditions and from its past record this shaft must have appealed to the miner as a safe one to work in and in most mining centres the sink would have been carried down for a considerable depth with very little, if any, timbering. On the Kolar Field, however, the chance of the occurrence of air-blasts had led to the adoption of careful methods of timbering even in places which would appear to be quite secure from heavy ground or normal falls of the roof and in the present case I must admit that the timbering was excellent and would have been regarded by miners from other fields as needlessly abundant and expensive. The square sets had been brought down to within 10 to 12 feet of the bottom of the sink down to which point the hanging wall was heavily lagged. The skip way had been completed down to within 25 feet of the sink and was only awaiting the further deepening of the sink, for a further permanently lagged section to be put in. The only exposed portion was therefore the 25 feet of the footwall of the shaft which was protected by the wall plates of the sets but not lagged. If I had inspected this shaft before the accident or if I had been working in the shaft myself I should not have considered any further protection necessary.

The air-blast completely shattered the footwall for a distance of some 50 feet up from the sink, breaking some of the lagging planks in the upper portion and throwing out a large quantity of rock from the lower unlagged portion some of which fell into the sink and caused the injuries reported. Mr. Beckwith is of opinion that if this lower portion of the footwall had been covered with temporary lagging behind the wall plates a good deal of the fractured rock would have been retained and prevented from falling into the sink. Mr. Beckwith suggests that I do not agree with this opinion, but that is not so. I think it quite possible that some of the lagging might have withstood the shock, but in dealing with problems of this character we must not forget that if the shock is a severe one the lagging itself and perhaps even the shaft sets might be smashed and sent into the sink in addition to the falling rock and the total damage increased.

On the whole however, after my inspection of the damage done I am in favour of putting in temporary lagging on the footwall right down as far as the sets will allow and the Superintendent is prepared to have this done. I do not consider that the omission to do so hitherto is in any way due to want of forethought or parsimony; on the contrary the timbering of the shaft appears to me to have been most carefully and even lavishly carried out.

* Bulletin No. 3, Mysore Geological Department.

IV. Meteorology and Seismology of the Kolar Gold Field.

Extracts from a Report for the year 1913 by Mr. Henry M. A. Cooke.

Meteorology.—Rock and air temperatures were taken underground at Champion Reef and Ooregum Mines. In both mines the rock temperature, where unaffected by air circulation, showed very little deviation from the average temperature gradient of the Field, previously taken, of 1° Fahr. rise in each 198 feet of vertical depth.

The temperature and humidity of the air in these mines, in levels in direct communication with the large vertical shafts, show the very great benefit derived from the enhanced air circulation from these shafts, for not only are the levels cooled, but what is more important, they are supplied with drier air.

The difference in the rock temperature in a crosscut to a shaft before communicating with the shaft, and after, is very marked and shows that the rock is considerably cooled by the circulation of air through the level, at a lower temperature than that of the rock, and by radiation, but it is probable that should the air circulation be suspended for any length of time, the temperature of the exposed rock would again rise to the normal temperature of the rock at that particular depth.

The heat in some stopes, which are above or below the air currents, is partly due to this cause, combined with an increase in humidity, which allows the heat from the rock to be the more readily transmitted from one wall of the stope to the other.

For some months the temperatures of the air in the downcast and upcast shafts at Champion Reef and Ooregum Mines have been regularly taken, and it is found that at both mines the temperature of the downcast air taken in the bottom cross-cuts has so far remained practically steady at 84° Fahr. at Champion Reef and 89° Fahr. at Ooregum, which may be taken as 8° and 13° higher than the mean air temperature at surface. The increase and steadiness of the temperature seem to indicate that the air absorbs heat from the walls of the shaft, and it will take a longer period of observations before it can be seen if the downward air will eventually reduce further the temperature of the rock walls of the shafts. The difference of 5° Fahr. between Champion Reef and Ooregum is probably due to the shaft at the former mine being lined with brick and not equipped, and therefore offering less resistance to the down-drawn air, than must exist at the Ooregum Mine where the shaft being timbered and fully equipped with dividings and haulage roads, allows the air to be longer in contact with the heated sides of the shaft.

The difference in the temperature of the downcast and upcast air at the Ooregum Mine is from 7° Fahr. to 8° Fahr. At Champion Reef owing to an accident to the thermometers, the average upcast temperature is not available at present, but new thermometers will shortly be exposed, and the observations carried over a long period should supply both useful and interesting information.

Seismology.—The two "Weichert" horizontal and vertical seismographs have worked satisfactorily throughout the year.

The local shocks recorded amount to 13,588 or 37·23 per day, as against 12,628 or 34·5 per day during the previous year, or an increase of 960 shocks during the year or 2·73 per day.

The number of shocks recorded are tabulated according to the months, the days and the hours in which they occurred.

The number and intensity of the shocks felt on the different mines are also tabulated.

In again attempting to discover any certain periodicity in the local shocks it is found that whereas last year the maximum number (taking the mean of three months) occurred in April, this year, the maximum occurred in October, and the greatest number were recorded between the 19th and 20th hours, whilst last year the maximum occurred between the 15th and 16th hours.

The mines have continued to record the shocks felt or observed, and the mean number so recorded amount to 2·1 per cent of those recorded by the seismographs. The Ooregum and Champion Reef Mines have again recorded the greatest number of shocks.

The maximum number of shocks recorded by the mines occur between the 9th and 11th hours, whilst last year the maximum number were recorded between the 12th and 13th hours.

From the above details it can be seen that there is considerable difference between the results obtained during 1913, as against those of 1912, and as remarked in former reports, there seems to be no periodicity in either the number or intensity of the shocks.

The results appear to confirm the remarks made in the report for the year 1911, that the shocks can be accounted for by the relief, through the underground excavation, of the previously existing forces in the rock.

The observations of the two spirit levels in the Observatory, which were installed in January 1913, are interesting, but it cannot yet be said that they prove that the local shocks have caused a change of level, for, other influences, such as changes of temperature, barometric pressure, precipitation, and other forces tend to the "displacement of zero", and it is doubtful if with spirit levels, however sensitive, the different periodicities of the several forces could ever be separated or determined, but no doubt this could be done with a certain type of horizontal pendulum.

The results hitherto, taking the observations for the whole year, show that there has been a rise to the South, and a rise to the East, or a fall to the North and fall to the West, which changes of level may be due, to some extent, to the earth movements accompanying the local shocks, added to the causes previously mentioned.

In conclusion I wish to again express my indebtedness to the Superintendents of the Mines for their continued help in supplying me with copies of the careful records which are kept of the occurrences of local shocks.

V. Prosecutions.

(*a*) In connection with thefts, etc., of Mining Material.

The following statement shows the number of cases dealt with during the year 1913, as compared with 1912, by the Assistant Commissioner and First Class Magistrate, Kolar Gold Field, in connection with theft and illegal possession of mining materials under Section 6 of the Mysore Mines Regulation :—

Year	Number of cases	Number of persons put up	Number of persons convicted	Value of property recovered
				Rs. a. p.
1913	80	102	79	8,122 8 8
1912	74	107	77	874 4 3

The following table shows the various kinds of mining materials in respect of which prosecutions were instituted during the year 1913 :—

Kind of material	Number of offences dealt with	Number of persons charged in each case	Number of convictions	Value of property recovered
				Rs. a. p.
Gold quartz	15	21	16	111 3 0
Auriferous tailings	12	20	10	95 3 0
Mercury	...	...	...	.....
Amalgam	11	12	12	6,264 10 0
Sponge gold	7	10	4	797 14 0
Bar gold	...	...	...	.....
Cyanide gold	1	2	1	162 12 0
Iron pyrites	...	...	...	.....
Explosives	3	3	2	123 3 11
Explosives*	...	...	...	4 12 0
Tools	16	18	18	549 12 9
Wood	9	10	10	8 14 0
Candles	6	6	6	4 1 0
Total ...	80	102	79	8,122 8 8

* Explosives found by the Police and confiscated in Court, but for which no person was chargeable.

(*b*) In connection with Accidents, Breach of Rules, etc.—

The following is a comparative statement for the three years 1913, 1912 and 1911 :—

	1913	1912	1911
Number of cases	38	48	48
Number of persons put up ...	45	72	51
Number of persons convicted ...	40	68	50
Number of persons acquitted ...	4	4	1
Number of persons discharged ...	...	...	...
Number of persons not found ...	1	...	...
Number of cases pending ...	...	...	...

Of the above, 16 cases were put up under the Indian Penal Code and 22 under the Mysore Mines Regulation. The penalties in the case of conviction ranged from fines of Re. 1 to Rs. 25 and imprisonment from 2 weeks to 3 months.

During the year, 12 persons were prosecuted for various breaches of the provisions of the Mines Regulation and Rules framed thereunder resulting in accidents, 9 of whom were convicted, 2 were acquitted and 1 absconded.

In one case not resulting in an accident one person was prosecuted and convicted for a breach of the above Rules.

Less serious offences committed in connection with 20 accidents entailed the departmental punishment of 28 persons by fines and by cancellation or suspension of their certificates. Similarly 6 other persons were dealt with departmentally for offences committed in connection with the provisions of the Rules not resulting in accidents.